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MINERALOGY.[1]

Friedel's Cours de Mineralogie.[2]—The first part of a text-book of mineralogy by Charles Friedel covers the field of general mineralogy. In the preface it is stated that a second part, devoted to special or descriptive mineralogy, will be prepared with the assistance of M. George Friedel, the author's son. The book does not claim to be, the author states, a treatise on crystallography or crystal physics, but a practical method of determining minerals on the basis of their morphological, physical, and chemical properties. It is intended for the use of those 'students who are preparing for the examinations for licentiate in physical sciences, and should therefore be adapted to the needs of college students.

The book contains 416 pages with the subject matter distributed as follows: introduction (giving history of science and fundamental definitions, 16 pages); organoleptic properties, 16 pages; crystallography, 238 pages; physical (and optical) properties, 59 pages; chemical composition occupies the remainder of the book and includes the divisions, blowpipe methods, mineral synthesis, and mineral classification. Under organoleptic properties are included among others, structure, color, lustre, density, external form (with a consideration of pseudomorphs), hardness, and streak. In treating crystallography eight pages are devoted to an exposition of Hauy's *théorie des décroissements*. This is followed by sections on the law of rational indices and symmetry. After deriving the crystal systems, the author gives eight pages to an exposition of Bravais's theory of crystal structure. No mention is made of the work of later writers on this subject, and throughout the book a tendency to utilize mainly the work of French writers seems manifest. The difficulties of translating Levy's symbols into those of Weiss, Naumann, Dana and Miller, makes it necessary to devote thirty-seven pages to crystallographic notation. Twelve of these are consumed by a table giving the equivalents of Levy's symbols in the other notations. An usually large amount of space for a book of this sort is devoted to the representation of crytals, but those which illustrate the book are very poor. Many of the figures are not merely carelessly, but incorrectly drawn. Crystals having a principal axis are generally lopsided. Figures 70, 138, 224, 255 and 322 are a few of the incorrectly drawn crystals. Another bad feature of the illustrations is that crystals are not always properly set up but are seen from all directions. The best portions of the work are those which treat optical mineralogy and mineral synthesis. The former is treated without mathematics and in a simple and practical manner. The section on the classification of minerals is very unsatisfactory. What purports to be a history of the subject is given. The systems mentioned are those of Werner, Hauy, Beudant, Delafosse and Dana. Groth's system is not mentioned nor is that of any other modern German mineralogist. A considerable number of pages is devoted to detailed lists of minerals as they appear in the schemes of Werner, Delafosse, and Dana. With the exception of the latter, which Friedel adopts as the one most in harmony with the present state of the science, these lists seem out of place. The book is not provided with an index, but has a somewhat extended table of contents.

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[1] Edited by Dr. Wm. H. Hobbs, University of Wisconsin, Madison, Wis.

[2] Cours de minéralogie professé a la faculté des sciences de Paris, par Charles Friedel. Minéralogie générale, pp. iii and 416. Paris, 1893.

As a text-book the work is subject to criticism on account of its classification and arrangement of subject matter, its lack of perspective in the treatment of the different divisions of the subject, its tendency to utilize mainly French investigations and systems, and its faulty illustrations.

Relation between Atomic Weight and Crystal Angles.— In a paper entitled, "Connection between the Atomic Weight of contained metals and the magnitude of the angles of crytals of isomorphous series, a study of the potassium, rubidium and cæsium salts of the monoclinic series of double sulphates $R_2M\ (SO_4)_2\ 6\ H_2O$," Tutton[3] has given the results of a most careful and thorough crystallographical study of an isomorphous series of salts, to determine the kind and degree of effect which the different bases exert upon the crystal angles. The results are very interesting since they seem to show a relation between the atomic weights of the contained bases and the crystal angles. The work involved no less than 9,500 measurements. The crystals were obtained by slow crystallization from cold solutions and ten good crystals of each salt were selected for measurement from a dozen or more different crops. The double salts of the formula $R_2M\ (SO_4)_2\ 6\ H_2O$ containing as univalent metals either potassium, rubidium, or cæsium, and as bivalent metals either magnesium, zinc, iron, manganese, nickel, cobalt, copper, or cadmium, were always prepared by mixing solutions of the two simple sulphates in equal molecular proportions. The study shows that the bivalent metal exerts no appreciable effect on the crystals, the predominant effect being due to the univalent metal present. The crystals of the potassium, rubidium, and cæsium salts have each a peculiar habit, that of the rubidium being intermediate between the other two. The axial angle β increases from the cæsium, through the rubidium to the potassium salt, its value in the rubidium salt being midway between the values in the cæsium and potassium salts. This is in close correspondence with the differences between the atomic weights of those bases. Tutton says "The relative amounts of change brought about in the magnitude of the axial angle by replacing the alkali metal potassium by rubidium and the rubidium subsequently by cæsium, are approximately in direct simple proportion to the relative differences between the atomic weights of the metals interchanged." The other crystal angles of the rubidium salts are likewise intermediate in value between those of the potassium and cæsium salts, but they do not show the same relation to the atomic weights of the alkali bases, the maximum deviation from such a relation being found in the prism zone. As these angles are for rubidium nearer to those of potassium than to those of cæsium, the author thinks that as the atomic weight of the alkali metal introduced gets higher, the effect of the metal on certain angles increases beyond a mere numerical proportion. Professor Tutton announces that this communication will be followed by another, which will discuss the changes in the optical constants of the crystals due to the same chemical substitutions.

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[3] Jour. Chem. Soc. London, Trans., Vol. LXIII, (1893), pp. 337–423.

Spangolite from Cornwall.—Miers[4] has found in a collection of Cornwall minerals presented to the British Museum, small crystals of the new mineral spangolite described by Penfield in 1890. The Cornwall crystals show the hexagonal prism, pyramid, and base. Their association is remarkably like that of Penfield's spangolite, as they occur with cuprite and its alteration products. From the characters of the associated liroconite and clinoclase, Miers thinks that there can be no doubt that the specimen is from St. Day, near Redruth.

Eudialite from the Kola Peninsula.—The occurrence of eudialite in the nephelene syenite and pegmatite of the Lujawr-Urt and Umptek in Russian Lapland, recently mentioned by Ramsay, has now been studied in detail.[5] The crystals have developed on them the forms $R, -\frac{1}{2}R, \frac{1}{4}R, -2R, \infty R2, \infty R$, and oR. The axial ratio is $a:c = 1:2.1072$. The mineral has good cleavage parallel to the base and one varying from very good to poor runs parallel to the second order prism. The color is usually cherry to garnet red. The crystals are specially interesting because of a marked zonal structure and of a division into sectors having differences in double refraction. Some of these sectors have positive and others negative double refraction. Like the eudialite from Magnet Cove the crystals are optically anomalous, sometimes having biaxial character with optical angle as large as 15°. On heating the sections of the crystals to a temperature at which boracite had become isotropic, all the sectors of the field seemed to give negative double refraction. Ramsay finds evidence that the different zones of the mineral possess different specific gravities as well as different double refraction, and he considers this to be due to isomorphous growth together of eudialite and eucolite. He shows that as regards axial ratio, specific gravity, double refraction and optical character, there is a gradation from the eucolite of Arö through the eudialites of Umptek and Kangerdluarsuk to the eudialite of Magnet Cove.

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[4] Neues Jahrbuch, 1893, II, 174.

[5] Neues Jahrbuch, Beil. Bd., VIII, (1893) 722.